What is claimed is:

1. An optical pickup apparatus for conducting recording and/or reproducing information for a first optical information recording medium including at least a transparent protective substrate with a thickness of t1 (0.5 mm ≤ t1 ≤ 0.7 mm), a first information recording surface, an intermediate layer and a second information recording surface which are laminated in this order from a light source side along an optical axis, comprising:

a first light source to emit a light flux having a wavelength of λ1 (380 nm ≤ λ1 ≤ 450 nm);

an objective lens to converge the light flux onto the first optical information recording medium;

a spherical aberration correcting structure to correct a spherical aberration caused in a converged spot on the first and second information recording surfaces due to an intermediate layer thickness when the objective lens converges at least a light flux emitted from the first light source on the first information and second information recording surfaces.

2. The optical pickup apparatus of claim 1, wherein the spherical aberration correcting structure changes an incident angle of a light flux with a wavelength of $\lambda 1$ onto an objective lens when the position of the converged spot of the light flux with a wavelength of $\lambda 1$ is shifted from one of the first and second information recording surfaces to the other one.

3. The optical pickup apparatus of claim 1, wherein the spherical aberration correcting structure moves an optical element arranged in the optical path of the light flux with a wavelength of $\lambda 1$, the first light source or both of the optical element and the light source along the optical axis.

4. The optical pickup apparatus of claim 3, wherein a finite light flux enters into the optical element.

5. The optical pickup apparatus of claim 4, wherein the finite light flux is a divergent light flux.

6. The optical pickup apparatus of claim 1, wherein the spherical aberration correcting structure comprises a liquid

crystal element which is arranged in an optical path of the light flux of a wavelength of $\lambda 1$ and controls refractive index distribution of the liquid crystal element.

7. The optical pickup apparatus of claim 6, wherein the liquid crystal element is divided into a plurality of areas depending on phase difference and the number of areas is from 3 to 6.

8. The optical pickup apparatus of claim 6, wherein a phase difference Φ between neighboring areas among the plurality of areas satisfies the following formula:

$$2\pi \times 0.04 \leq |\Phi| \leq 2\pi \times 0.12.$$

9. The optical pickup apparatus of claim 1, wherein the optical pickup apparatus comprises a plastic optical element which is arranged in an optical path of a light flux with a wavelength of $\lambda 1$ and wherein the phase difference correcting structure changes a characteristics of the optical element by providing temperature fluctuation to the optical element.

10. The optical pickup apparatus of claim 1 or 3, wherein the spherical aberration correcting structure corrects a spherical aberration in a converged spot on the first and second information recording surfaces caused by an oscillated wavelength deviation from a designed wavelength of the light source due to an individual difference of light sources.

11. The optical pickup apparatus of claim1, wherein an optical element which is arranged in the optical path of the light flux with a wavelength $\lambda 1$ and is not movable during the optical pickup apparatus operation, the light source or both of the optical element and the light source are moved along the optical axis at the time of producing the optical pickup apparatus in order to correct a spherical aberration in a converged spot on the first and second information recording surfaces caused by an oscillated wavelength deviation from a designed wavelength of the light source due to an individual difference of light sources.

12. The optical pickup apparatus of claim 1, which the optical pickup apparatus conducts recording and/or reproducing information on a second optical information recording medium having a transparent protective substrate

with a thickness of t2 ($0.5\ mm \leq t2 \leq 0.7\ mm$), using a second light source to emit a light flux with a wavelength of $\lambda 2$ ($650nm \leq \lambda 2 \leq 670nm$).

13. The optical pickup apparatus of claim 1, which the optical pickup apparatus conducts recording and/or reproducing information on a third optical information recording medium having a transparent protective substrate with a thickness of t3 ($1.1\ mm \leq t3 \leq 1.3\ mm$), using a third light source to emit a light flux with a wavelength of $\lambda 3$ ($750nm \leq \lambda 3 \leq 850nm$).

14. The optical pickup apparatus of claim 1, wherein a focal length f of the objective lens for the light flux with a wavelength of $\lambda 1$ satisfies the following formula:

$$2.0\ mm \leq f \leq 4.0\ mm.$$